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HAI High Sign *Special Edition*

Carbapenemase-Producing Organisms

News from the Virginia Department of Health

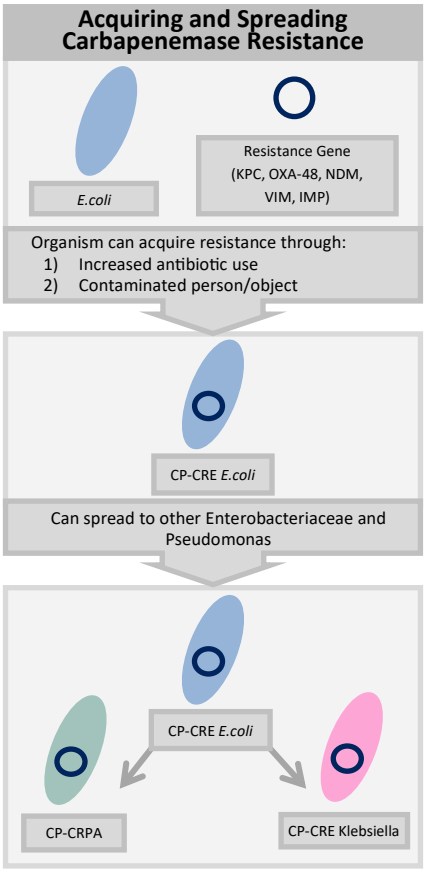
Healthcare-Associated Infections and Antimicrobial Resistance Program

In this issue:

The Problem with Carbapenemase-Producing Organisms (CPOs)

Every year about 2 million Americans get infections from antibiotic resistant germs, and more than 23,000 die from their infections[1]. These germs can arise from one of four resistance mechanisms: 1) Destruction of the antibiotic (e.g., carbapenemases), 2) Efflux pumps, 3) Target site alteration, or 4) Decreased permeability of the antibiotic. Carbapenemases are concerning because the carbapenemase production gene is encoded on a bacterial plasmid that can easily transfer between organisms, allowing resistance to spread silently and quickly. **When carbapenem-resistant Enterobacteriaceae (CRE) and carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) produce carbapenemases, they are referred to as CP-CRE and CP-CRPA**. These infections can easily spread from patient to patient, and from facility to facility. With no treatment options, these infections are the most serious antibiotic resistant infections and can often lead to death. VDH is committed to preventing CP-CRE and CP-CRPA.

[1] Antibiotic/Antimicrobial Resistance. Atlanta (GA): Centers for Disease Control and Prevention. 2018. https://www.cdc.gov/drugresistance/index.html



Carbapenemase Resistance Genes

1. *Klebsiella pneumoniae* carbapenemase (KPC)
2. Oxacillinase-48-type carbapenemase (OXA-like)
3. New Delhi metallo-beta-lactamase (NDM)
4. Verona Integron-encoded metallo-beta-lactamase (VIM)
5. Imipenemase metallo-beta-lactamase (IMP)

Timeline of CP-CRE and CP-CRPA

2001: First CP-CRE identified in U.S.

2013: CDC releases antibiotic resistant threat report

August 2016: CDC funding for increased surveillance at the state level

March 2018: DCLS Virginia public health lab goes live with CRE/CRPA carbapenemase testing

April 2018: CDC releases *CDC Vital Signs* with Containment Strategy

Close to Home: CPOs in Virginia

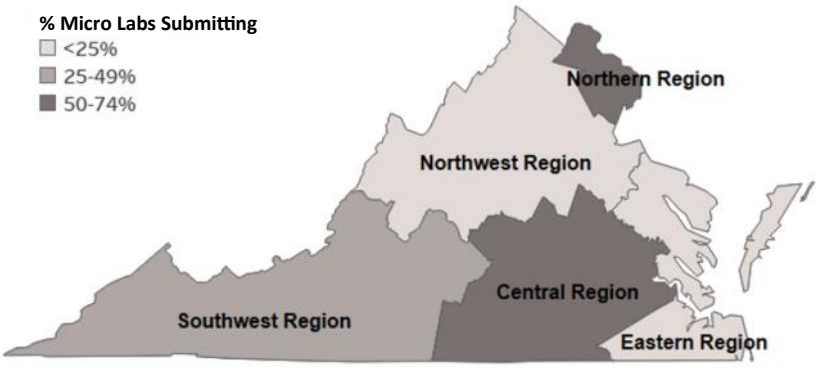
From March 26, 2018 through August 31, 2018

- **288 isolates have been tested at DCLS**
- **26% have been positive for carbapenemases**

Close to Home: CPO in Virginia (continued)

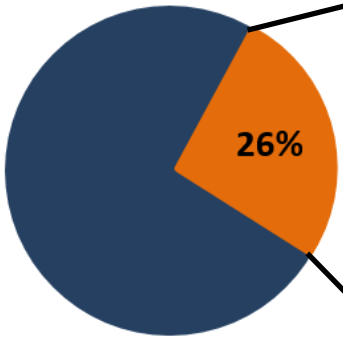
Facilities forwarding isolates to DCLS are participating in the containment strategy to help decrease AR threats. VDH and DCLS would like to thank all submitting labs, and strongly encourage those who are not submitting to do so.

Facilities Submitting

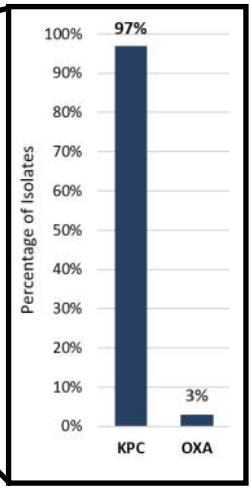


The majority of carbapenemase producing isolates tested have been identified as KPC, however, Virginia is starting to see more non-KPC isolates. Collaboration is key to help prevent non-KPC isolates in Virginia.

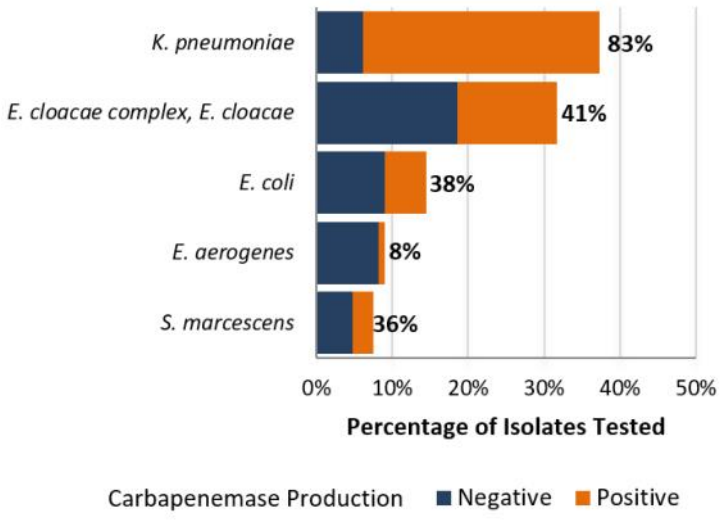
Percent Carbapenemase Producing (n= 288)



Resistance Genes Identified (n= 77)



Top 5 CRE Tested for Carbapenemase



To prevent MDROs the CDC Containment Strategy should be utilized.

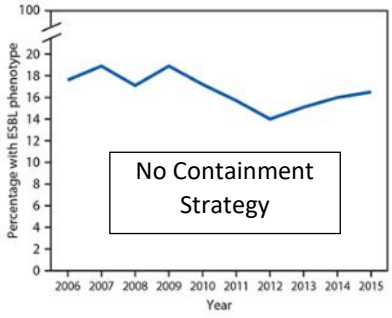
So far, the Containment Strategy has been used in the following healthcare settings:

- **Acute Care Hospitals**
- **Long Term Care**
- **Outpatient Practices**

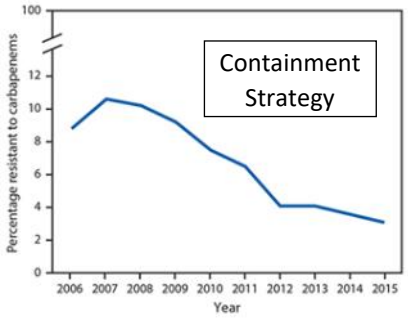
The Containment Strategy for MDROs

Evidence the Containment Strategy Works

According to the 2018 *CDC Vital Signs* report, NHSN data from the CDC show increased detection and aggressive early response decreases antibiotic resistance threats compared to a non-aggressive strategy.



% *E. coli* and *K. pneumoniae* isolates from selected HAIs with ESBL phenotype reported as non-susceptible to extended-spectrum cephalosporins



% *E. coli* and *K. pneumoniae* isolates from selected HAIs reported as resistant to a carbapenem

What is the Containment Strategy?

Goal

- Slow spread of novel or rare multidrug-resistant organisms or mechanisms

Response

- Systematic, aggressive response to a SINGLE case of high concern of antibiotic resistance

Approach

- Response activities are tiered (see below) based on organism/mechanism attributes

CDC Multidrug-Resistant Organism (MDRO) Tiers

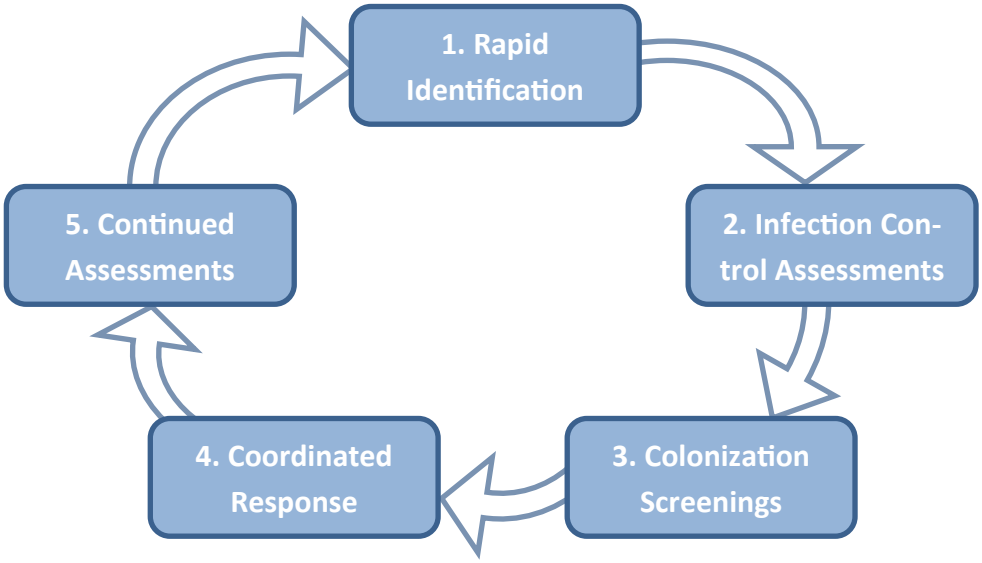
Tier 1	Tier 2	Tier 3
•Resistance mechanisms novel to the U.S. •Organisms for which no current treatment options exist (pan-resistant) **In Virginia:** •Novel resistance mechanisms •Pan-resistant isolates •VRSA	•MDROs primarily found in healthcare settings but not found regularly in the region; organisms might be found more commonly in other areas in the U.S. **In Virginia:** •CP-CRE caused by KPC, NDM, VIM, IMP, OXA •CP-CRPA caused by KPC, NDM, VIM, IMP, OXA •*C. auris*	•MDROs that are already established in the U.S. and have been identified before in the region but are not thought to be endemic **In Virginia:** •Not applicable until more is known

Taken from CDC MDRO toolkit

The Containment Strategy for CP-CRE and CP-CRPA

Containment Strategy in Practice for CP-CRE and CP-CRPA

For CRE alone, the CDC estimates the Containment Strategy can reduce infections by 76%. It includes five elements:

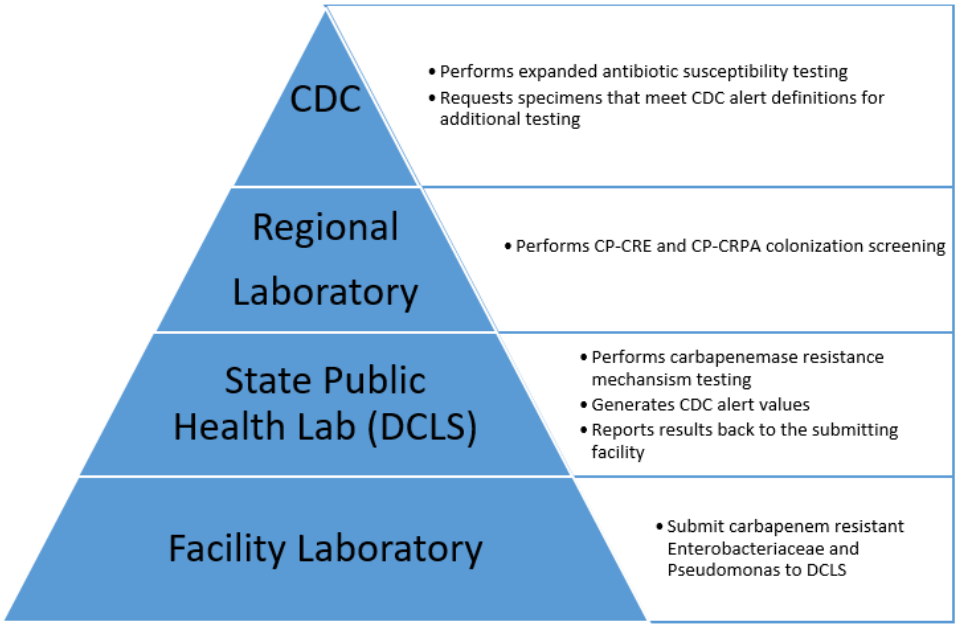


1. Rapid Identification

The CDC established the Antibiotic Resistance Lab Network, or ARLN, in 2016 to:

- Rapidly detect antibiotic resistance in healthcare and the community
- Provide comprehensive lab capacity and infrastructure for AR pathogens
- Prevent spread of future AR threats

The AR Lab Network includes labs in 50 states, five large cities, Puerto Rico, seven regional labs, and CDC.



Consult your local health department regarding screenings for all patients who have had an overnight stay in a healthcare facility outside the U.S. in the past year.

2. Infection Control Assessments

Infection Prevention is an important strategy to stop the transmission of CP-CRE and CP-CRPA. Facility infection prevention policies should include the following:

Infection Prevention Measure	Acute Care Facility		Long-Term Care Setting	
	Infected	Colonized	Infected	Colonized
Standard Precautions	Yes	Yes	Yes	Yes
Contact Precautions	Yes	Yes	Yes	Yes, if high risk for transmission*
Private Room	Yes	Yes	Yes	Yes; if feasible
Door signage	Yes	Yes	Yes	Yes
Designated or disposable equipment	Yes	Yes	Yes	Yes
Visitor Recommendations				
Perform hand hygiene often, and always after leaving resident's room	Yes	Yes	Yes	Yes
Wear gown/gloves if contact with body fluids is anticipated	Yes	Yes	Yes	Yes
Wear gown/gloves if no contact with body fluids is anticipated	No	No	No	No

*unable to perform hand hygiene, ventilator-dependent, incontinent of stool or urine, dependent on staff for activities of daily living (ADLs), draining wounds

When patients are identified at your facility with CP-CRE or CP-CRPA, the local health department may ask to conduct an **infection control assessment** to help guide their recommendations on healthcare contact screenings. Assessments should be completed on a regular basis to help identify and correct any deficits.

3. Colonization Screenings

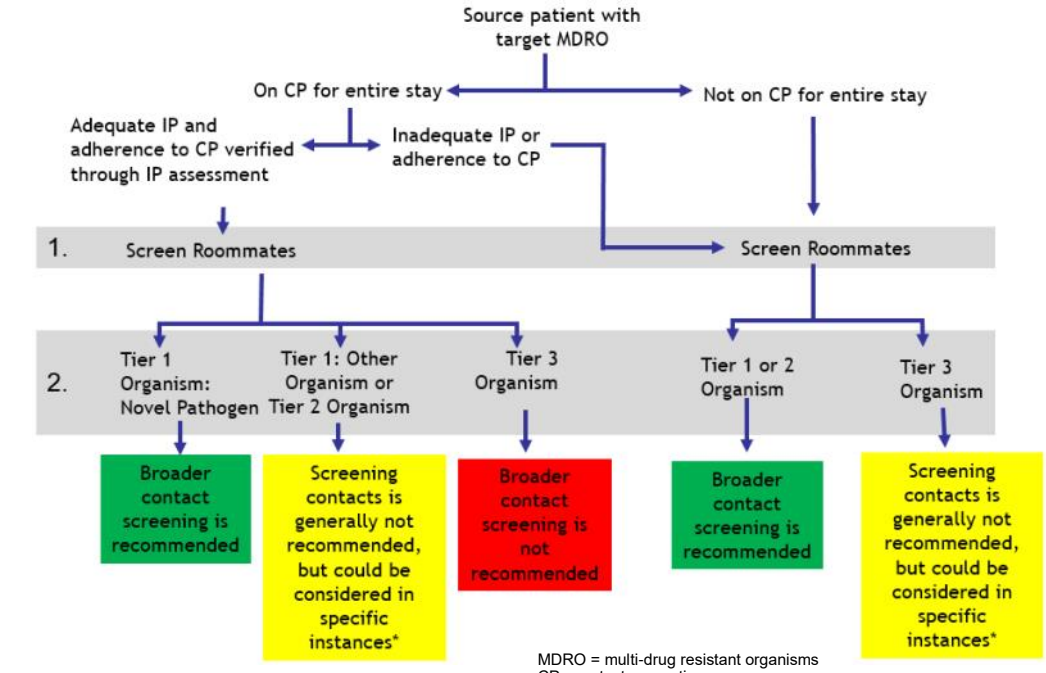
The purpose of screening is to identify asymptomatic carriers so that additional control measures (e.g., contact precautions) can be put into place. The rationale for this testing is that clinical testing might only identify a small proportion of patients who are colonized. Screening typically involves collecting and testing rectal or perirectal culture swabs.

Screening can involve: screening contacts; conducting a point prevalence survey; or conducting active surveillance testing.

When CP-CRE or CP-CRPA is identified in a facility, the facility should work with the local health department to identify patients who should be screened. This is available through the ARLN at no charge to the patient or facility.

3. Colonization Screenings (continued)

Algorithm for approach to screening healthcare contacts:

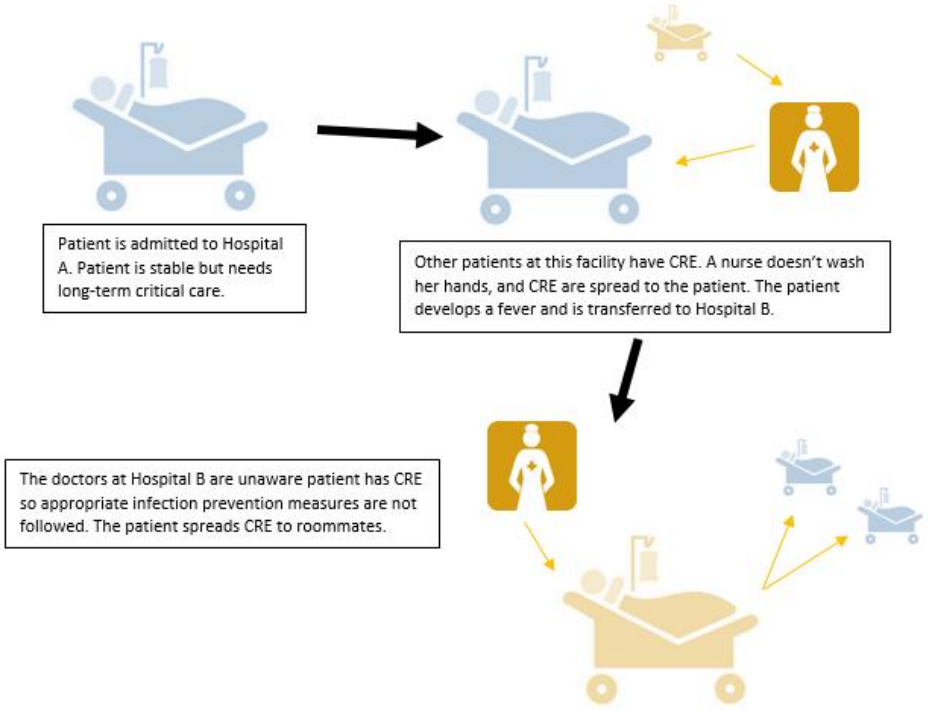


* see organism specific guidelines

MDRO = multi-drug resistant organisms
CP= contact precautions
IP = infection prevention

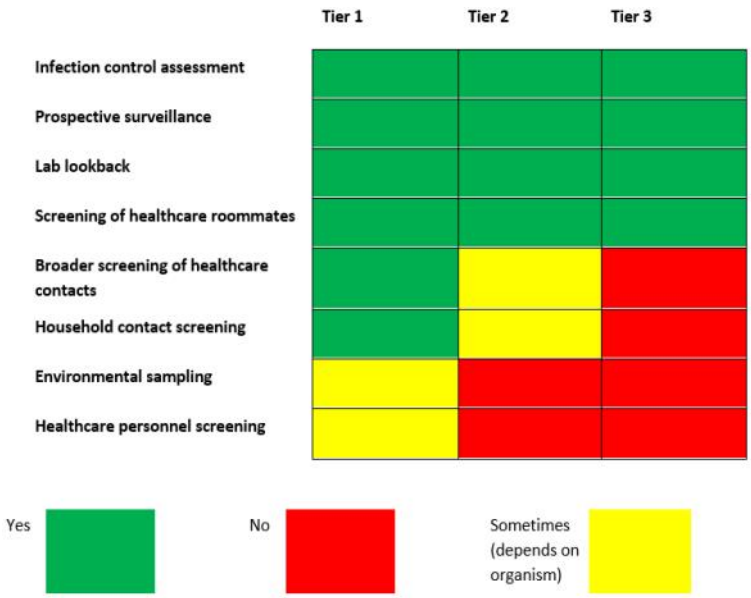
4. Coordinated Response Between Facilities

CP-CRE and CP-CRPA can spread rapidly to other facilities. Infection prevention information should be transferred **with the patient at the time of transfer** to ensure the accepting facility is implementing the correct measures. The CDC Inter-facility Infection Control Transfer Form can be used if no other form is currently being used at the facility. You can find the form here: https://www.cdc.gov/hai/pdfs/toolkits/InfectionControlTransferFormExample1.pdf



5. Continued Assessments and Screenings

Once an MDRO is detected in a facility, be on high alert for transmission. Encourage the laboratory to continue to send CRE and CRPA isolates to DCLS for mechanism testing. Continue to work with your local health district on enhanced surveillance and response.



Summary

- Facilities should submit all their CRE and CRPA isolates to DCLS for further mechanism testing
- Facilities should communicate and collaborate with the health department when CP-CRE or CP-CRPA is identified
- A coordinated approach between healthcare providers/facilities and public health is necessary to help decrease antibiotic resistant threats

Resources

April 2018 CDC Vital Signs Report: https://www.cdc.gov/vitalsigns/containing-unusual-resistance/index.html

CDC MDRO Toolkit: https://www.cdc.gov/hai/containment/guidelines.html

CDC CRE Toolkit: https://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html

VDH CRE Page: http://www.vdh.virginia.gov/epidemiology/epidemiology-fact-sheets/carbapenem-resistant-enterobacteriaceae-cre/

DCLS CRE CRPA Testing Instructions: https://dgs.virginia.gov/globalassets/business-units/dcls/documents/hot-topic-and-updates/cre-crpa-testing-instructions_v1-003.pdf

Antibiotic Resistance Threat Report: https://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf

Healthcare-Associated Infections (HAI) and Antimicrobial Resistance (AR) Program

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